

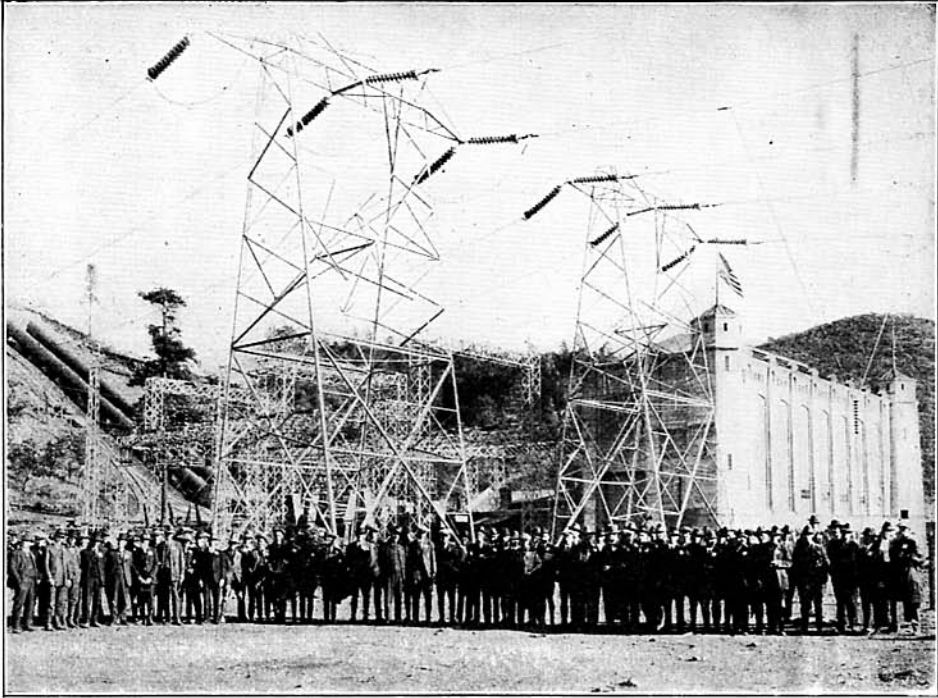
The World's Longest Line Radio System

By CHARLES W. GEIGER

THE Pacific Gas & Electric Co. now has in successful operation the world's longest guided radio telephone and telegraph system between the Vaca-Dixon substation and the Pit River Power House No. 1. The system utilizes the twin circuit 220,000-volt transmission lines between the two points for a conducting medium, a total distance of 202 miles, and is for the sole purpose of directing the operation of the two stations both under normal and emergency conditions.

The system is coupled to the transmission line through a single wire antenna about 1800' long. This wire is attached to the twin vertical circuit transmission towers at a point on the center line of the tower and at the elevation of the middle cross arm. Six standard 10" suspension insulator units are used for dead ending and supporting the antenna. The main station ground system is also used as a ground for the radio equipment, sending on a wave-length of about 10,000 meters.

The transmitting equipment is a regular vacuum tube Radiophone similar to those used by the high power broadcasting stations. Four 250-watt and one 50-watt Radiotron tubes are employed, two of the tubes being used as oscillators and two as modulators with the 50-watt tube as a speech amplifier. The plates of the 250-watt tubes are supplied with a potential of 2,000 volts D.C. from a 2-kw. generator. This generator has two commutators, each supplying 1,000 volts D. C. and



The High Tension Lines and the Aerial at the Pit River Power House. Note the Aerial Parallel to the Lines and the Lead in on the Right. A Wave-Length of 10,000 Meters is Employed in This Wired Radio System.

a tap is taken off to supply 1,000 volts D.C. potential to the plate of the 50-watt tube. Mounted on the same shaft with the 2000-volt generator is a 1 $\frac{3}{4}$ -kw., 125-volt exciter which also has sliprings for supplying 88 volts, 30-cycle alternating current. This 88-volt alternating current is stepped down to 11 volts through a special 800-watt transformer and is used for lighting the filaments of all the tubes. The generator and exciter are driven by a direct connected 6 $\frac{3}{4}$ -hp., 115-volt D.C. shunt-wound motor. This motor derives its energy from the main station storage battery which is unusually large in order to handle the 220,000-volt oil circuit breakers. Normally the battery floats on the charging set and a contactor has been installed in connection with the automatic motor starter which short circuits a portion of the charging generator field rheostat and permits a rise in generator voltage to compensate for the extra load of the radio motor generator set. Thus under normal conditions of operation no drain is placed on the storage battery. An automatic motor starter is used for control of the motor-generator set, the starting and stopping of the set being accomplished by taking the telephone receiver off or putting it on the hook.

The receiving equipment consists of a Colin B. Kennedy type 110 Universal receiver, which has been modified to make it a non-regenerative receiver, and a Western Electric loud speaking outfit using two stages of audio-frequency amplification.

Calling is accomplished by mounting a calling microphone in the horn of the loud-speaker which, when the calling circuit is completed, will oscillate and howl in much the same manner that the ordinary telephone will howl when the receiver is placed against the transmitter. This gives a very loud note, the pitch of which will depend upon the natural period of oscillation of the diaphragms and which is clearly audible in all parts of the station. Ordinarily, it is not necessary to use the calling system, as the receivers are always in service and the operator is near the set so that the loud speaker simply talks to him and he starts up his set and talks back. The system is arranged for simplex operation and all that is necessary is to operate a small telephone switch which energizes a contactor to connect either the transmitting or receiving set to the antenna, thus permitting talking or listening.

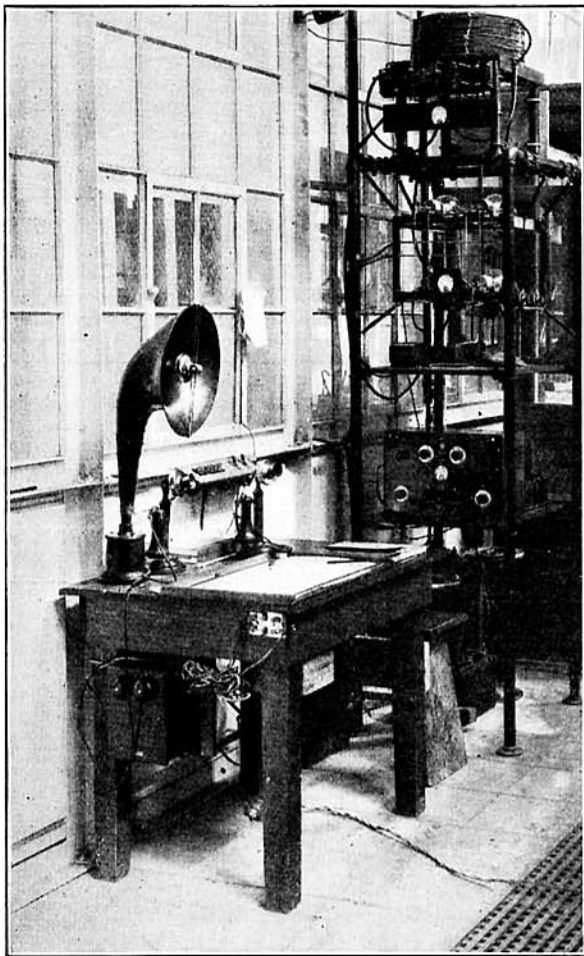
All the experimenting and development work necessary to place the equipment in a satisfactory operating condition was done under the direction and supervision of Dr. L. F. Fuller.

The accompanying photos show the temporary equipment during the experimental stage at Pit River Power Plant No. 1.

USE OF KILOCYCLES IN RADIO

The Second National Radio Conference, which met with Secretary Hoover in March, introduced a method of designating radio waves which is somewhat new to the radio public. This is the use of frequency in kilocycles (abbreviated kc) instead of wave-length in meters. The advantages of this practice have been familiar to radio engineers for some time, and it is probable that it will eventually replace the use of wave-length in meters. As a matter of fact, wave-length is a somewhat artificial conception in the handling of radio apparatus and is one of the difficult things for the beginner to understand. The frequency of the radio

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The Transmitter and Receiver Installed in the Power House. Note the Calling System Consisting of a Microphone Attached in the Horn of the Loud Speaker Which Howls When the Other Station Rings.